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ABSTRACT

This publication reports findings of research that focused on routes young people could take into engineering, and outcomes of a conference held at the University of Surrey (England) in July 1987 to initiate further action and reflect on the research. In Part I, connections are made with other developments in education and training, in particular with the National Council for Vocational Qualifications, which provided the conference with its main speaker. The keynote speech (Mike Ridley) presents some perspectives on the National Vocational Qualification framework to identify standards of occupational competence. Part II describes the content of engineering-related courses and programs that may lead to employment in the industry. It also considers the possibilities of progressing from one of these courses into engineering employment by matching attainments at each of the transition points to those required in initial training. Part III provides conference feedback and recommendations. These issues are highlighted: bridging, initial assessment, increased school-industry liaison, and increased publicity. Research recommendations are made concerning module or course content, industry input, assessment and profiling, progression, and publicity. Part IV draws together the views of a wide range of individuals involved with education and training within engineering: employers, college staff, teachers, and students. (YLB)

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**University of Surrey**
Department of Educational Studies

# PROGRESSION into ENGINEERING

## Building Bridges Between Education, Training and Employment

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New programmes are developing in engineering and technology, and PROGRESSION INTO ENGINEERING explores the ways in which programmes can be linked and co-ordinated to maximise the experiences, skills and knowledge of young people as they progress into the industry.

This booklet is the result of a year's research by a team at the University of Surrey and reflects the views of representatives of schools, colleges and industry. Contributions are included from speakers and participants at the specially organised conference held in 1987 to consider future developments and to make recommendations.

The team:

Karen Evans – Co-ordinator

Veda Dovaston
Jan Shepherd — Researchers

The research was sponsored by the Manpower Services Commission and was undertaken at the University of Surrey within the Centre for Research in Youth and Further Education.

July 1988

# PROGRESSION INTO ENGINEERING


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## INTRODUCTION

In 1986 the Manpower Services Commission initiated a research project based at the University of Surrey which was to focus on the different routes which young people could take into engineering. New courses and schemes were starting which were designed to give young people access to the industry, and in some cases experience of working within it. In particular, the Youth Training Scheme (YTS) is introducing many youngsters to engineering, and college and school work within the Technical and Vocational Education Initiative (TVEI) and the Certificate of Pre-vocational Education (CPVE) are introducing 14–18 year olds to vocational skills and competences which could later be transferable to the engineering world.

A research team working in the Department of Educational Studies set out to establish what type of foundation each of these courses or schemes would provide for engineering trainees with and to match it against the types of initial training current in the industry. The team's specific brief was to identify any clear *gaps* in the provision resulting from taking any of the options or routes, and to put together outlines for bridging modules – additional training or education – to 'bridge' students from any one course or scheme to another.

The following questions formed the basis of the research:

*Can TVEI, CPVE and YTS be defined in such a way that links with occupational training can be established?*

*Can engineering-based modules be devised to bridge students or trainees into engineering?*

*What alternative mechanisms might facilitate progression into the industry?*

*How could the modules or mechanisms work in practice and what can we do to ensure that progression takes place?*

*What are the benefits of bridging to the industry and to the trainee?*

As a result of the research, one 'bridging module' emerged which could 'top up' candidates for employment or work based schemes. The mismatch between whatever skills or competencies were acquired pre- and post-employment was found to be so variable from scheme to scheme, region to region and individual to individual that 'TVEI modules', 'CPVE modules' and 'YTS modules' were found to be unrealistic. Instead, what emerged was a picture of what work-based training within employment constituted across the range of engineering skills and jobs, and the extent to which it could build on the types of experiences which recruits were likely to have had. It was found that a general introduction to engineering was a useful basis on which to begin specialised training, and that most of the schemes or courses would provide some or part of this general foundation, though which parts and in what form would depend on a whole range of factors.

The team's recommendations and conclusions therefore centred on what this foundation might look like and the ways in which individualised programmes could take it into account when planning courses – usually preceding entry to the industry.

How this set of recommendations might be implemented in a day-to-day training environment is beyond the brief of the research, but the intention was to pull together a flexible set of engineering-related 'foundation skills and competencies' which could be delivered in any basically equipped context – schools, colleges, industrial workshops – and which could be adapted to different rates of working, expertise and prior knowledge, acknowledging the *actual* achievements of trainees and reducing or extending their training programmes to suit their real needs and those of their employers.

In addition, it became clear that a number of other issues impinged on the implementation of bridging arrangements – for example the recording of skills and competencies, and the continued necessity for schools-industry links. It is suggested that some systematic way of ensuring that communication between the different sectors is necessary, possibly in the form of local or regional working groups with cross-sectoral representation, and that steps are taken to ensure that the industry itself does not impose age barriers to recruitment which restrict entry arbitrarily.

The research was conducted over a twelve-month period, and was based on interviews conducted nationally with young people, teachers, lecturers, trainers and employers. In addition, consultants were engaged to look in detail at syllabuses, course content and training programmes and to do formal analyses and comparisons. The research was reported in a set of five reports.

*– the main document[1], separately available, describes in more detail the methodology and background to the conclusions*
*– four shorter reports consider the issues and possibilities of implementation in five industrial contexts (Scotland[2], Bedfordshire, Berkshire, Poole and Wirral).*

A further dissemination period following the year's formal project life culminated in a Conference in July 1987, attended by representatives of all sectors and intended to initiate further action as well as reflect on the research conclusions and recommendations.

This publication is based in part on the findings of the research and in part on the outcomes of the Conference. It has been put together to illustrate and exemplify the key points emerging, and to ensure the wider availability in written form of the main speakers' and participants' contributions to the Conference. The text is divided into four parts:

*PART I*
THE NATIONAL CONTEXT – connections are made with other developments in education and training, in particular with the National Council for Vocational Qualifications, which provided the Progression into Engineering Conference in July with its main speaker, Mike Ridley, a former engineer and now NCVQ Director in charge of Accreditation.

*PART II*
SUMMARY FINDINGS – the content of the research study itself is the focus, with some parts drawn from the Conference presentation and others based on the background papers to the Conference workshop sessions.

*PART III*
CONFERENCE FEEDBACK AND RECOMMENDATIONS

*PART IV*
PERSPECTIVES – this section draws together the views of a wide range of individuals involved in education and training within engineering, based on interviews conducted during the research.

[1] *Progression into Engineering: Building Bridges Between Education, Training and Employment* by Karen Evans, Jan Shepherd and Veda Dovaston (1987). University of Surrey. Department of Educational Studies.

[2] The Scottish Case Study was written and based on research undertaken by Mrs. Heather M.C. Malcolm of the Scottish Council for Research in Education.

# PART I: THE NATIONAL CONTEXT

## INTRODUCTION

The purpose of the study has been, in broad terms, to establish whether there is a need for more formal arrangements which would enable young people to progress into higher levels of occupational training in engineering from specified pre-vocational courses and Youth Training Schemes.

The study was commissioned by the Manpower Services Commission (MSC) to contribute to its aim of facilitating the transition of young people into employment as expressed in 1981 in the first of its national objectives in the 'New Training Initiative':

> "We must develop skill training including apprenticeship in such a way as to enable young people entering at different ages and with different educational attainments to acquire agreed standards of skill appropriate to the jobs available and to provide them with a basis for progression through further learning". [1]

The study reflects a complex picture of change in which the establishment of new and more flexible routes into employment is an immediate priority. The recent White Paper 'Working Together' summarises this concern:

> "Decisions at 16+ should not be irrevocable: *bridges and ladders* between the various routes to employment and to further and higher education will need to be built. Both the extension of TVEI and 2-year YTS should result in many more young people achieving vocational qualifications, and the same or similar qualifications may often be obtained through both these and other routes". [2]

The research team was asked to consider with reference to the engineering industry the possibilities of developing 'bridging' modules which would build on skills acquired in TVEI, CPVE and YTS schemes to provide entry to industrially-based training and employment at different levels.

In order to fulfil the research brief, it was first necessary to establish the potential for bridging within the engineering industry and the providing agencies. This has involved a general and fairly wide-ranging review of arrangements and attitudes in engineering and engineering-related education and training. It has also been necessary to try to anticipate developments in all of these areas – a particularly important task in the light of the many recent changes which affect long-term plans and trends.

The engineering industry was chosen for study as it represented a major employer of school leavers, with an established system of foundation training regulated by the industry itself, through the Engineering Industry Training Board.

Its time-serving apprenticeships originally arose within 'heavy' manufacturing industry. Shipbuilding, steel production, car manufacture, all had a recognised need for a continuous and large supply of labour with certain specific skills, anticipating relatively stable employment conditions and skill needs. This type of industry, and the training style it adopted, tended to be concentrated in certain geographical areas such as the English North East and Midlands, and parts of Scotland and South Wales.

Recently these industries and the industrial life of the areas they dominated have suffered a decline resulting in unemployment and a reduction in the demand for engineering skills. Elsewhere, however, and in other parts of the industry, reductions in the labour force and changes in skill needs have been caused by other factors – most importantly by increasing mechanisation and the introduction of computerised systems, robotics and other technological developments, which have made the industry less labour intensive.

Overall, engineering employment had declined by 1984 in all regions of Britain to between 58 per cent and 78 per cent of even 1978 levels, with the Southern parts of England least affected. The traditional forms of apprenticeship training, and especially craft training – which focusses more heavily on the specific skills required to operate the basic manual machine tools (milling, turning, grinding and so on) – have all declined dramatically, while the demand for technicians who can maintain and use the new types of machinery is much less affected.

One of the effects of this decline has been that many off-site training courses have ceased to be viable (an issue highlighted in the NVQ Engineering Report[3]), and many on- and off-site courses are only viable because of YTS craft traineeships for youngsters, some of whom may leave the industry to seek employment elsewhere after the completion of their programme.

Despite these reductions, however, many serious skill shortages exist, frequently but not always in areas of comparative industrial expansion. Difficulties in recruitment, particularly of young people,

[1] *A New Training Initiative: A Consultative Document.* Manpower Services Commission (1981). Sheffield.

[2] *Working Together – Education and Training.* Department of Employment and Department of Education and Science. Cmnd 9823. (1986). London: HMSO.

[3] *Review of Vocational Qualification: Vocational Education and Training in Engineering, A Sector Case Study.* Prepared jointly by staff at the Engineering Industry Training Board, the Business and Technician Education Council and the City and Guilds of London Institute. (1986).

sometimes seem to stem from poor image problems created in part by plant closures and job losses. Overall cuts in training budgets and in staff tend to cause skill shortages in themselves, however, as established employees leave or retire and there are no internal staff to replace them. This is particularly so if a period of retrenchment is followed by a period of expansion.

Technological change, while frequently reducing the numbers employed in the industry, nonetheless increasingly demands major expenditure on both initial and continuing training, and often this training can only be carried out in a highly specialised environment, sometimes with one machine requiring special training programmes to be devised around it.

This specialised training, however, often needs to build on a background of industrial knowledge, and it is this which young people frequently lack, though increasingly both vocational and pre-vocational programmes (such as TVEI, CPVE and YTS) will provide them with at least a part of the background knowledge and skills they required.

It is in this area that the potential for a 'bridge' was found – additional engineering-related programmes which would take individuals up to the level at which specialised training would begin, facilitating trainee choice and flexibility, avoiding unnecessary duplication and, for the employer, reducing initial training cost and realistically enabling an increased number of young people to be taken on.

The research recommendations on p. 26 were made in the light of these benefits, encompassing likely content areas for a set of these 'bridging' modules and suggesting ways of assessing attainments already gained.

A number of attempts have been made nationally to address the education and training issues which arise from changing skills needs in engineering – and from similar changes in other industries.

Pre-vocational and vocational initiatives have been heavily funded and promoted. On the pre-vocational side, the Technical and Vocational Education Initiative (TVEI) and the Certificate of Pre-vocational Education (CPVE) have become established features of the system in England and Wales. The main development in vocational training for 16-18 year olds has been the introduction of the Youth Training Scheme (YTS) in 1983, which at first provided for one year of training for school leavers and from 1986 set out to provide a guaranteed two years of training for sixteen-year olds. Less well known than the specific initiatives for 14-19s are the more general trends and developments which have taken place in initial technology education in schools. There has been a continuing move from courses in specific areas, for example woodwork, metalwork and technical drawing, to more broadly-based technology courses incorporating a range of skills. This has, in the most part, been the schools' response to the change to new technology which is occurring in the industry itself.

In line with the DES recommendations, on the 'Curriculum 5-16'[4] there has been the extension of technology to 11-14 year olds in order to give all pupils in secondary schools the opportunity to sample a variety of crafts and technologies before deciding on their courses at 14. The new orientation of many technology related courses has been consolidated by the introduction of the new GCSE syllabus. The foundation upon which pre-vocational and vocational studies build has also, therefore, been subject to change.

While the system of vocational education and training has strengths of diversity, responsiveness and credibility, concerns about the lack of a clear pattern of provision and shortcomings in the areas of access, progression and transfer led, in 1985, to the setting up of a Working Party to undertake the Review of Vocational Qualifications (RVQ). The task of the review was to recommend a structure of vocational qualifications in England and Wales which is:

- relevant to the need of people with a wide range of abilities
- comprehensible to users
- easy of access
- recognises competence and capability in the application of knowledge and skill
- provides opportunities for progression
- allows for the certification of education, training and work experience within an integrated programme.

The review resulted in the recommendation that a national body – the National Council for Vocational Qualifications (NCVQ) be set up to develop a coherent system of vocational qualifications in England, Wales and Northern Ireland.

While arrangements in Northern Ireland are closely aligned with those in England and Wales, the position in Scotland is significantly different. The Scottish system is more centralised and does not have the same proliferation of vocational exam bodies to contend with. According to the Review document,

[4] *The Curriculum from 5 to 16* (Curriculum Matters No.2) Department of Education and Science (1985) London, HMSO.

Scotland was excluded from the remit of RVQ11 'because of the progress they had already made through the 16+ Action Plan in rationalising and reforming vocational qualifications, and by the merger of SCOTBEC and SCOTEC to form SCOTVEC' (RVQ, 10.2)[5].

A new framework for all non-advanced further education (NAFE) qualifications in Scotland has been introduced between 1984 and 1986. The framework is based on 40-hour modules drawn together into flexible programmes of study. The National Certificate, which credits students' cumulative performance, is awarded by SCOTVEC. The introduction of the National Certificate, alongside the extended YTS and TVEI provision has created a different pattern of 'bridges and ladders'.

Our principal task has been to explore bridges into engineering from YTS, CPVE and TVEI within the context of patterns of provision available in England and Wales. However, the Scottish development held interest and possible lessons. In view of this, and of the stated aim of the Government to secure mutual recognition of equivalent vocational qualifications in England and Wales and Scotland, our work included a study of the Scottish System.[6]

The introduction of TVEI, CPVE and YTS and the establishment of the NCVQ, representing between them a major shift towards a more structured vocational education and training system have all taken place within the span of four years.

Furthermore, each is undergoing change and evolution within itself; 1986 was a significant year for TVEI, CPVE, YTS and the NCVQ. Within TVEI, it saw the announcement of plans to introduce national funding to cover every state school in 1987; for CPVE, it represented the first year of the non-pilot scheme; and for YTS, the first year of the two-year scheme. The Review of Vocational Qualifications reported and recommended the establishment of the NCVQ in 1986, shortly after our study was launched.

At the time of writing it is not possible to gauge what the full implications of these initiatives are, or indeed to judge their effectiveness. In tackling our task, therefore, we have taken the situation as we find it, and have tried to take into account the different ways in which it might develop.

In particular we have recognised that provision of 'bridging courses' as originally envisaged by the Manpower Services Commission might not be the only way of securing progression opportunities.

With vocational qualifications under review at the same time as our study and many of the foundation training schemes (notably TVEI and CPVE) in their pilot stages, it was necessary for us to think about alternative mechanisms for 'bridging' between schemes.

Could, for example, the content of the schemes themselves be adjusted to reduce or remove gaps? Could or should this be achieved at local level? Or should more formal systems of credit and exemption be put in place at national level?

The paper which follows presents some perspectives from NCVQ on these issues, and the reader is referred to Section IV for some complementary (and sometimes opposing) perspectives from practitioners.

[5] *The Review of Vocational Qualifications in England and Wales (1986).* Manpower Services Commission/ Department of Education and Science.

[6] See separate Scottish Case Study by Heather M.C. Malcolm.

## KEYNOTE SPEECH

**Mike Ridley, National Council for Vocational Qualifications**

> 'The present arrangements for vocational qualifications are complex and confusing. In some occupational areas there are many qualifications and the relationships between them are not understood by employers or those seeking training. In others there is a lack of suitable qualifications and access is unnecessarily restricted. Only 40 per cent of the UK workforce hold recognised qualifications, a considerably lower proportion than in other major industrial countries with which we compete'. *National Council for Vocational Qualifications – Its Purpose and Aims*, p.3.

No doubt you will have views on such an assertion in respect of its applicability to your own area of interests but one might be forgiven for arguing that this conference or the research that led up to it wouldn't be necessary if many similar problems did not exist in relation to developments both in schools and in bridging from schools to work. In any event this was one of the problems identified by a Review Group which reported to Government last year. Government in turn responded with a White Paper outlining a new national framework for qualifications to be known as the National Vocational Qualification framework and established the National Council to bring it into being.

The Government set the National Council nine specific tasks:

- identify and bring about the changes necessary to achieve the specification and implementation of standards of occupational competence to meet the needs of the full range of employment, including the needs of the self-employed.
- design, monitor and adapt as necessary the new NVQ framework.
- secure the implementation of that framework by accrediting the provision of approved certifying bodies.
- secure comprehensive provision of vocational qualifications by the certifying bodies.
- secure arrangements for quality assurance.
- maintain effective liaison with those bodies having responsibilities for qualifications which give entry to, and progression within and from, the system of vocational qualifications into higher education and the high levels of professional qualifications.
- collect, analyse and make available information on vocational qualifications and secure the operation of an effective, comprehensive and dependable data base.
- undertake or arrange to be undertaken research and development where necessary to discharge these functions.
- promote the interests of vocational education and training and, in particular, of vocational qualifications and to disseminate good practice.

But what does the new NVQ Framework offer?

The design of the actual framework itself envisages that there will be a number of levels.

The first four of these levels are defined very loosely in the White Paper and steps have now been taken to provide a fuller description.

The higher the level of a qualification the more it may indicate combinations of some of the following factors:

- breadth and range of competences attained
- complexity and difficulty of the competences attained
- degree of skill
- ability to undertake specialist activities
- ability to organise and plan work
- ability to transfer competences from one context or work environment to another
- ability to innovate and cope with non-routine activities
- ability to supervise others.

The levels themselves look like this:

**LEVEL 1: BASIC LEVEL (Typical Requirements)**

Qualifications at this level should accommodate both those that match a minimum job requirement, and those designed as an entry to employment led programmes such as the Youth Training Scheme.

They will typically include the ability to perform a minimum number of work activities, within realistic time constraints to specified standards (usually under supervision and in a restricted range of working conditions and contexts) necessary for employment in a generic group of activities or occupations and may be preparatory to the development of further employment competence.

Where competence at this level is designed as an entry to employment it should be based upon a foundation of broad-based vocational education and training, with emphasis on core skills, personal effectiveness and planned work experience.

The aim here is to try and accommodate both those very basic jobs which require limited skills and knowledge and also, *importantly* qualifications awarded to people who may not be as yet committed either due to circumstances or inclination to a particular field of employment. (An obvious consideration here is 2-year YTS. There is of course already in existence the YTS Certification Board. There it is only reasonable for an approved YTS programme to be judged independently against NCVQ criteria rather than just taking the YTS Certification output as the answer.)

**LEVEL 2: STANDARD LEVEL**

Qualifications at this level will be awarded for competences needed for many occupations whose achievements are significant but which are primarily of a routine and predictable character.

They will indicate ability to perform at normal rates and performance levels, common work related activities to specified standards including some activities that may be complex and difficult.

The minimum standard of qualifications at this level should ensure competent performance in an extended range of contexts under both normal and difficult working conditions with minimum guidance and induction.

Amongst the competences achieved should be some that are transferable from one context to another thus allowing the individual to make connections between tasks and to demonstrate a degree of flexibility in adapting to new situations. Awards at this level will be terminal qualifications for many common jobs and occupations.

An important feature of Level 1 and Level 2 may be that for the first time there could be national qualifications for semi-skilled or skilled operative jobs.

In Engineering we are perhaps looking to the elements and segments specified by the Engineering Industries Training Board being subject to independent assessment outside of full craft or technician training and thus providing a basis for qualifications at this level.

However, the fact that many such jobs are narrowly constructed and require employer-specific – rather than employ*ment*-specific skills and knowledge makes it difficult to reconcile with the idea of a *national* qualification.

Qualifications at this level will be awarded for competences needed for occupations which are *not* of a routine character and which may require application in a variety of contexts and roles.

The minimum standards of qualifications at this level will be those appropriate to occupations which include those that require or have in the past required at least a full apprenticeship. The skills achieved at this level may be of such a nature as to indicate capability in supervisory and junior management roles or in advanced further education and training. Awards at this level will be terminal qualifications for many skilled jobs and occupations.

In fact in engineering terms, I myself see it embracing the engineering craftsman and the engineering technician.

Qualifications at this level will be awarded for competences needed for occupations with specialist or supervisory or professional requirements and which need the capacity to adapt to major job role changes whilst maintaining full accountability and responsibility for personal outputs and those of others.

They will indicate ability to perform a comprehensive range of complex, difficult and often specialised work related activities, appropriate to the designing and planning of products, services, operations and processes to specified standards and/or to undertake the training and the supervision of others to satisfying employers' and customers' needs.

The minimum standards of qualifications at this level will be appropriate to complex, specialist and supervisory functions, and for those occupations where education and training needs are presently met by Higher National awards plus, where appropriate, additional skills, understanding and ability in application needed for the trainee to be regarded as competent or their equivalent. The skills achieved at this level will be sufficiently extensive to indicate capability in senior management roles.

A Vocational Qualification is a *statement of competence* needed to facilitate entry into, or progression in employment and/or further education and training which incorporates assessment to specified standards of:

- skills
- knowledge
- ability in application

A key word here is:
*specified standards:*
these are standards of performance. Unless they are known and expressed in terms that are comprehensible and as far as possible objective, firstly no-one will know what it is that a person is supposed to be capable of; secondly they will not know what to measure, nor to what standard, nor again how best to measure it to ensure the validity of the result in relation to the person's capability.

The National Council is determined that the standards of competence which its qualifications purport to represent should be employment-led.

Two key elements arise from the term 'employment-led'.

The first is that the standards of competence are those necessary to perform the tasks that make up jobs in industry – or of course commerce.

The second is that it is those influential in employment – employers and employees – who determine what those standards ought to be.

They must specify them and they must take them into ownership. They must not abdicate their responsibility for them and must ensure they have a mechanism for keeping them up to date.

Employers are sometimes too ready to condemn present qualifications as inappropriate to the needs of their employees in the workplace. Too often though, it is not the fault of the awarding bodies. Whether they be academic or training bodies. Some have made every effort to consult with employers about what they should be providing.

The employers have declined to give time to articulating the real needs of the workplace, but are still too often quite content to be critical of the outcome when it proves inappropriate.

The research report seems to read as though there is consensus among employers and that they are all supportive of the efforts of people like yourselves in developing new approaches to bridges to the world of work. I have to express some cynicism, not in I hope any critical way. Merely to ensure that by speaking with the few; and those of the few who are aware, interested and supportive, can allow one to fall into the trap of complacency. We must never be complacent on these matters. There is a lot of marketing to be done and it takes a long time to gain an understanding of what is trying to be achieved.

Even so, the National Council will be seeking evidence from the awarding bodies that the employment standards on which the qualifications for which they seek NCVQ endorsement are those recognised in employment and agreed by those responsible for setting and monitoring those standards in the workplace.

Another key step for a qualification to be valid in NCVQ terms is that there must be *assessment*.

Clearly this poses problems. Effective assessment is expensive to administer.

The assessment must be *valid*, by that I mean it tests what it purports to test; and reliable, that is, the person subject to a test could be expected to perform much the same if he/she went through the assessment process again – that is repeatability of performance – and also people with the same degree of competence will perform largely the same in the test.

If at any time these elements are in conflict then it is validity that must prevail.

I must also commend to you criterion referencing. People want to know what it is that a candidate can do. It is not an issue that can be fudged only when we know what the candidate can't do. If he or she needs to be able to do it, we know what additional training is necessary to enable the required level of attainment to be achieved.

Assessment must also be viable; that is, it must not be prohibitively expensive and must be possible to conduct with the facilities available.

The choice of the assessment technique must be made on the basis of a clear specification of what is to be assessed. This is in turn developed from the standards agreed for the sector of industry or commerce or the occupation concerned.

The White Paper setting up NCVQ states that we should consult widely and report back to government on how self-financing skills testing may be extended consistent with the Council's plan for the development of the NVQ framework.

Let me say that in general an effective system of simulated skills assessment independently administered is very, very expensive even if it were always practical and in some cases it is manifestly impractical.

In the field of engineering, the nature and size of equipment and systems sometimes give us an advantage but in others it would be impossible to fund and support simulated systems. To my mind the answer is straightforward, assessment must increasingly take place at the workplace and operated by those who supervise at that workplace. It is they after all who set and demand the standard of work expected of their staff; it is they who judge on a day-to-day basis the competence or otherwise of the people for whom they have responsibility.

Again there are indications in the report that recognition of this fact is growing and needs to be developed further but there will sometimes be resistance to this approach, both from the supervisors themselves and from those who believe any such approach is bound to be biased or to the detriment of national standards. I think we should seek to overcome this resistance through adequate training of those charged with the responsibility.

In order to achieve the desired results I don't believe every supervisor needs an in-depth knowledge of assessment techniques. In my view quite limited training coupled with *supportive* moderation will be adequate to meet the requirements.

A further question is how often should assessment take place, not so much in terms of continuous assessment, but in terms of what forms a credible package of learning, – a 'module'.

What NCVQ has said about modules is that they can be a valuable mechanism for structuring and delivering training. They are not the 'be all' of training arrangements and should be seen in the context of what constitutes a suitable mechanism for delivering a particular education or training programme.

The NCVQ is exploring how an effective mechanism for credit accumulation and transfer across the whole further education and training field can be developed. This is a key activity and obviously to reach full fruition a longer term one.

If one contemplates a *National* Vocational Qualification, it is likely that it has a certain breadth about it.

For example if one contemplates someone in full-time education perhaps completing a course which leads only to the knowledge relating to full competence at the workplace rather than its application, that person may only have a part-qualification in NVQ terms.

Some mechanism for recording such a *credit* needs therefore to be available.

Equally someone qualified in one occupation, but whose job for some reason is lost, may have the constituent elements of the qualifications for another activity.

Clearly therefore a means to record achievement and part qualifications could be an extremely valuable asset in UK Ltd terms. It also gives an opportunity to those who by way of pre-vocational qualifications seek entry to an industry.

Let us therefore look at the differing schemes in relation to *true* vocational education and training.

*TVEI first*. The key feature is a broad-base to begin with at 14 or thereabouts, but it is later, for the 16-18 year olds that difficulties really start.

Inevitably the expectations of parents especially tend to lead them to think of those not following GCEs and its successors as receiving second best treatment. If TVEI is about breaking this mould I think there is a long way to go and a direct link with post-school or post-FE vocational qualifications as seen by NCVQ may not help.

TVEI is not a course; it is a programme based on given guidelines and criteria. As such it is difficult to recognise it as meeting in any way the full NCVQ criteria for an accredited qualification at least to those who complete its programme in schools as opposed to FE. There are of course big differences between what is possible in FE and schools.

It may be that with the capacity to run the full range of vocational courses, whether CGLI, RSA, BTEC or whatever that FE does have an advantage – except where the school/college links enable BTEC units to be run whilst the student is still based in school.

The major challenges for both school and FE arising from TVEI are *organisational*, eg making a wide enough range of modules available, and *attitudinal*, that is valuing vocationally unmatched education and helping the individual to progress rather than first putting people on courses.

As regards contributions to NVQ then our plans for credit accumulation should help. It is just possible that parts of a pre-16 modular curriculum could lead to credit towards an NVQ.

An attendant difficulty though is presented by the role of GCSE at 16+ and 'A' level. They are unashamedly 'non-vocational' and schools will promote them claiming entry to Higher Education depends on them. Until students regularly enter Higher Education through other routes the problem will remain.

*What about CPVE?* It was developed as a *framework* for structuring provision and recording achievement on one year full-time courses which began to be developed in Further Education in the 1970s.

Its essence is really in *improving general* educational attainment and providing an *introduction* to vocational studies in order to provide a 'basis for choice'.

As such perhaps it is a child of its time which could be overtaken by events particularly TVEI and YTS. It is possible to argue that if curriculum continuity is required, then YTS provides the work-based route and TVEI the education-based route.

Probably CPVE pioneered such things as broad-based vocational education, profiling personal counselling, etc which will be taken over by others.

Since CPVE is intended as a basis for *future* choice and achievement, its individualised nature is not surprising. With a strong core of general skills and knowledge and the overall profile recording achievements based on a much looser definition than NCVQ's Standards require it is equally unsurprising that I at least can see little by way of a direct contribution to an NVQ.

The quality of work experience or work simulation within CPVE is highly variable and with assessment not being based on clear performance criteria even the credit accumulation system I have described gives little hope for confidence that we could come to a different view.

It has in any event been suggested to me that CPVE will disappear with it pioneering achievements in aspects of our vocational preparation arrangements.

I have already mentioned YTS and described how Level 1 qualifications gained through its pursuance could lead to a Level 1 qualification at least.

I should just add that the Certification Board has recently approved systems or frameworks within which competences can be achieved as the basis for acceptable qualifications. As such the good trainee, with the right opportunity, might well go beyond a Level 1 qualification.

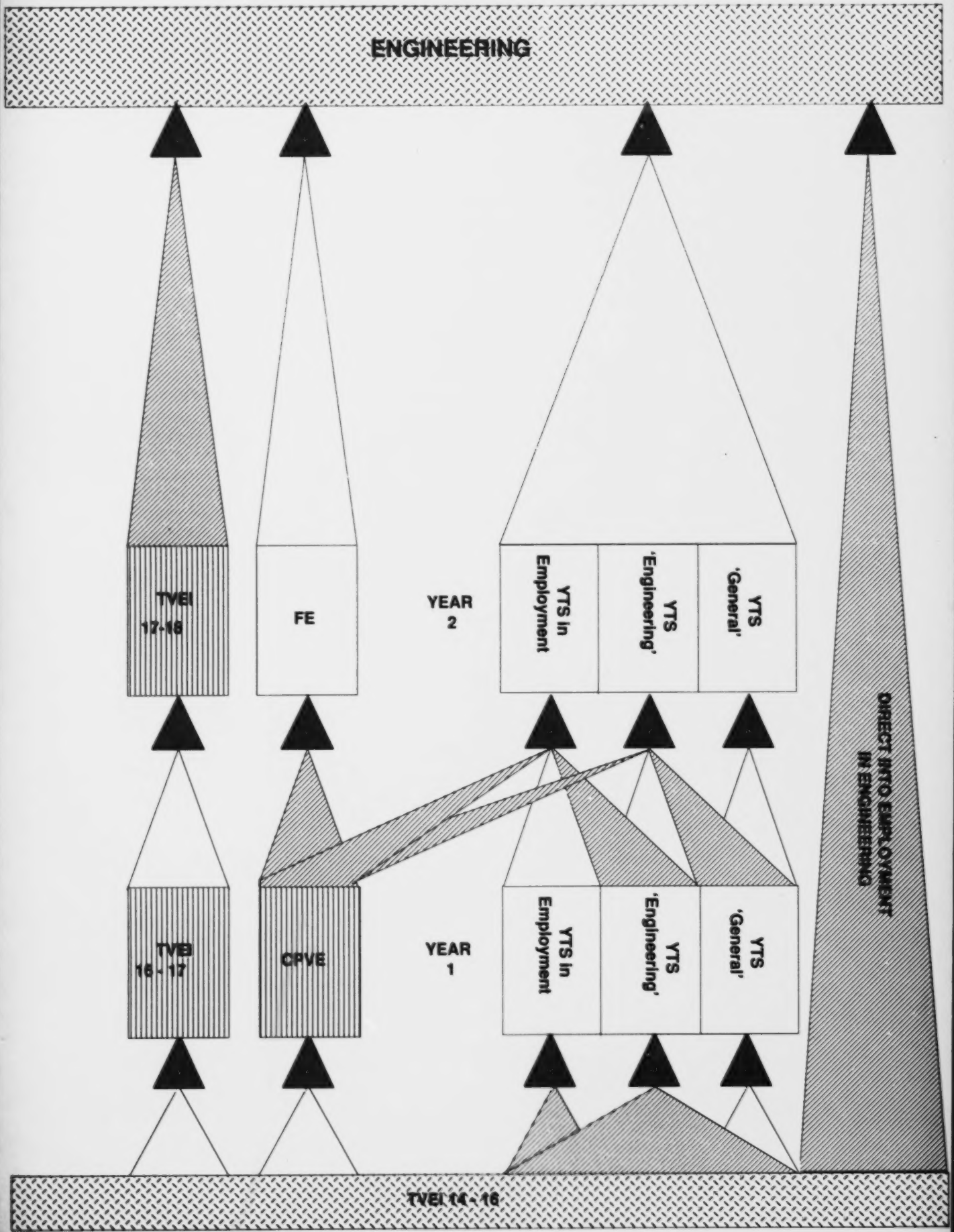
Equally though I think MSC has to look closely at what NCVQ accredits at the thresholds between levels in order to ensure that YTS trainees are on the right lines for achieving an NVQ.

Equally awarding bodies with NCVQ have a role in deciding where those thresholds lie. At present there are a lot of modules and first parts of academic awards that need pulling together into coherent packages to provide real broad-based foundations for young people entering industry and I think this is particularly so in engineering and other technical functions such as motor vehicle maintenance and repair and electrical installation where traditional patterns based on apprentice training tend to focus on craft and technician routes leading to Level 3 qualifications with little by way of stepping off points in between.

However, in saying that I hope that the wider issues of vocational preparation which have come so far to fruition in recent years are not to be distorted by the ultimate necessity to bridge from full-time education to the more specific requirements of employment-led standards of competence needed at work.

We must maintain a balance between the needs of young people in the formative stages of their development and the need for them to acquire the skills and knowledge particular to their early careers.

# Progression into Engineering



## PART II

## SUMMARY FINDINGS

The research commissioned by the Manpower Services Commission was designed to explore the content of engineering-related courses and schemes which may lead to employment in the industry. A second phase of the research focussed on the implications which this may have on progression, including the possibility of mechanisms and modules bridging individuals into employment. The following sections summarise the main conclusions of both research phases and the diagram on the facing page illustrates how the different courses and schemes were seen as interlinking. The research focussed on the *content* of the schemes and courses in the shaded boxes, and on the possibilities of progression to other schemes, courses or into employment as represented by the shaded triangles. It looked, for example, at how a 16-year-old school-leaver could transfer attainments in TVEI to an engineering-focussed Youth Training Scheme, and how a CPVE student could transfer into the second year of an employment-based Youth Training Scheme. It also considered how YTS trainees could transfer from one type of scheme to another, following for example an offer of in-house employment or a trainee decision to enter engineering after an initial YTS period acquiring more general employment skills.

It is worth making the point that the schemes and courses are all subject to major variations, including those in employment. While one or two defined programmes or checklists exist – such as the 'standard' craft training programme and City and Guilds or BTEC options – *all* TVEI, CPVE, YTS schemes and in-company training is flexible and variable, dependent on a whole range of factors.

The content of the shaded areas in the diagram cannot therefore be closely defined. What has been done within the research is to try to establish the common areas of experience within each type of provision. This was problematic both within educational, training and industrial schemes, and the box marked 'engineering', for example, can mean many different things. This equally means that the employment-based parts of the other three schemes are variable, particularly Youth Training Schemes, which are often largely employment-based. On the other hand, some of the 'theoretical' components of all schemes are common across the board – the published City and Guilds Engineering programmes and some BTEC modules are sometimes a component of TVEI, CPVE, YTS and employment-based training, and this is often an important aspect of effective transfer from one scheme to another (for example, BTEC undertaken in CPVE can be transferred directly into a Technician training scheme).

For these reasons, short descriptions are included below of each of the following:

- the CPVE framework
- the TVEI framework
- the YTS schemes which may lead into engineering
- the City and Guilds and BTEC frameworks, particularly relating to engineering
- the basic components of engineering training

### ENGINEERING AND TECHNOLOGY PROGRAMMES

#### Technical and Vocational Education Initiative (TVEI)

TVEI is essentially a funding mechanism and relates to an approach to teaching and learning. It is not a qualification in its own right, but leads to nationally recognised qualifications, CSE, GCE and GCSE as well as those more commonly linked with vocational training – C&G and BTEC. The programme designed for 14–18 year olds promotes relevance in the curriculum to the 'world of work' and encourages the development of skill and qualities which will be of direct value to students when they enter employment. Emphasis is also placed on progression through from school based courses onto the post-16 phase and onto vocational training and higher education.

For practical purposes within the research assumptions have had to be made about common and likely types of provision within TVEI relevant to engineering, specific skills and core or general skills which may be directly relevant to engineering:

- most TVEI students who intend to enter engineering will have followed technology/engineering courses leading to GCSE in, for example, Craft, Design Technology (CDT), Technology, Design and Realisation and Electronics, and also C&G and BTEC which are more common in the post-16 phase. The more recently developed courses lay emphasis on design, the ability to communicate ideas and problem solving as well as aiming at raising awareness and interest in the industry as a whole.
- the TVEI 'core' aims to develop the more general qualities of initiative motivation and enterprise, and encourages students to work as a member of a team and to gain information technology-related and general problem solving skills.

Work Experience is an integral part of TVEI programmes and may provide direct experience of an engineering company.

**Certificate of Prevocational Education (CPVE)**

CPVE is a flexible programme for students of 16+, which can be followed in schools or colleges and if taken full-time lasts for one year. It meets the needs of students who intend to enter full-time vocational education, training or employment but who are not yet firmly committed to vocational choice and may also want to retake and improve their performance in examinations taken pre-16.

CPVE allows students to:

- gain CPVE accreditation within a range of 'core' areas including numeracy and communication
- follow C&G, BTEC, GCSE etc. courses to examination standards as required
- follow 'taster' vocational courses which provide an introduction to various vocational areas
- pursue accredited vocationally-focussed courses including those leading to 'CPVE preparatory module' certification
- experience work situations first hand through a work placement

In practice only a small proportion of CPVE courses are as yet relevant directly to engineering. However, students who do follow engineering-focussed CPVE programmes are likely to take City and Guilds or BTEC units within it.

In a general sense, CPVE is itself a 'bridging' course designed to meet the varying needs of students who may require, most commonly, additional GCSE qualifications to gain entry to training or employment. It enables them to work for these and to follow parallel vocationally-focussed programmes at the same time. As a 'taster' for the uncommitted student, it also informs choice and builds confidence.

**Youth Training Schemes (YTS)**

All school leavers of 16 have the option of two years of YTS vocational training. Schemes have to include a minimum of 20 weeks of off-the-job training, with the remaining time based in a work setting. (Some schemes include substantially more than the minimum off-the-job period – see, for example, 3 below.)

Three types of YTS scheme were identified as relevant to engineering:

1. *YTS 'General':*
   schemes which include no engineering-focussed off-the-job components, but which may be based in an engineering work environment which enables some relevant skills or knowledge to be acquired.
2. *YTS 'Engineering':*
   schemes which include an engineering-focussed off-the-job component plus work-based training in an engineering environment.
3. *YTS 'Apprenticeship style' training:*
   schemes in which the trainee is employed by the organisation running the scheme and is following a programme very similar to that formerly used for full-time apprentices, frequently including a lengthy off-job initial training period.

*City and Guilds Engineering and Training Board–devised skills programmes are commonly used as a basis for 2 and 3.*

**City and Guilds**

The City and Guilds of London Institute provides an integrated system of syllabuses, examinations and certification, which is produced in line with recommendations from its Policy Committee for Education and Training composed of representatives of industry, education and training. It provides a unified system for national training standards and national certification in general and specific vocational preparation.

There are no specific entry requirements, and the responsibility for the recruitment of students onto courses rests with the institutions – mainly Further Education colleges but also schools – which place students according to their needs, abilities and interests. The institution also has the flexibility to give students credit for previously gained experience, and, if they have demonstrated that they have gained appropriate levels of attainment, exemptions for parts of the course can be given.

City and Guilds course are usually organised in day or block release for people already in employment on a training programme or as part of YTS.

*Basic Engineering Competencies (C&G 201)*

C&G 201 is aimed at a range of occupations and is intended to form a bridge between academic (GCSE), pre-vocational (CPVE) and vocational courses.

It has been accepted by EITB as being complementary to its programme of industrial training, and will receive joint certification from EITB and C&G where appropriate.

The scheme is designed to be competence based where competence is displayed through skill, knowledge, attitude and experience in performing a work-based activity. The course is taught through task-based activities involving four key areas:

1. Communication
2. Planning
3. Doing
4. Checking.

**Business and Technician Education Council (BTEC)**

BTEC is one of the main national bodies offering accredited vocational courses, and BTEC courses form a recognised part of many work-based training programmes, such as YTS or employer-sponsored foundation training, and of pre-vocational courses such as CPVE and increasingly TVEI.

BTEC programmes – whether full- or part-time – are normally followed in Colleges of Further Education or Technology, though with the introduction of TVEI and CPVE, they are now also being offered in schools.

Courses are available at three levels – First Award, National and Higher National – representing progressively more advanced levels of study, with entry to each dependent on attainment within the previous one or on other formal qualifications with established equivalency. In practice, there should be a fairly formal system of exemptions into each level, with GCSE and City and Guilds qualifications giving exemptions or partial exemptions for particular units or for whole programmes. Similar equivalencies are being sought for work undertaken within CPVE and TVEI.

BTEC courses are an essential component of all technician level training in engineering, and may also form part of craft training schemes.

With the introduction of the 1987 BTEC regulations it will be necessary to have a minimum of BTEC National Certificate to qualify as an engineering technician, and a minimum BTEC Higher National Certificate to qualify as a technician engineer (for which the basic entry requirement is BTEC National or A levels).

The BTEC First Award is a more flexible 'entry to engineering', and, whether taken full-time or as part of a CPVE course, is seen primarily as a way of progressing into BTEC National courses.

**PROGRESSION**

In considering the possibilities of progressing from one of these schemes or courses into engineering employment, some general attempts were made within the research to 'match' attainments at each of the transition points to those required in initial training.

**1. An introduction into the industry**

TVEI: most CDT or technology based courses and all engineering focussed City and Guilds or BTEC courses will provide this

CPVE: any student who takes an *introductory vocational* module in engineering will have effectively had an introduction to the industry

YTS: 'General' – only informally, if at all
'Engineering' – during induction and normally in off-the-job training (though not if focussed strongly on Engineering *Skills*, as some programmes are).
'Apprenticeship' – during induction and off-the-job training.

**2. Introduction to the employing organisation**

This may be provided within the work experience component of TVEI, CPVE and YTS. There is some evidence that work experience leads to employment offers in all three, though this is not its primary aim.

**3. Safety**

Any practical work has safety implications, and it is assumed that relevant safety procedures are taught in all environments.

It is often noted, however, that safety regulations within schools and colleges do not have to conform to the same legal standards as those in industry.

All industrial training, whether within an industrial placement or in full employment, should of necessity include relevant safety training, even where the trainee can already display a knowledge of safe practices.

**4. Familiarity with tools, machines and materials**

TVEI: all CDT technology and engineering-focussed courses will include basic familiarity

CPVE: engineering-focussed students will have basic familiarity if they have done an *exploratory* module

YTS: 'General' – possibly some familiarity
'Engineering' – should have full familiarity
'Apprenticeship' – should have full familiarity

The extent of familiarity of TVEI and CPVE students in particular will vary. They may have a developed knowledge of uses and properties to a point where there is substantial overlap with operator, technician and even craft programmes.

**5. Some basic practical engineering skills**

TVEI: all CDT, technology and engineering-focussed courses will include some practical skills

CPVE: engineering-focussed CPVE students will have some practical skills if they have done a relevant *exploratory* module or *preparatory* modules

YTS: 'General' – in most cases, limited practical skills acquisition
'Engineering' – should be competent in a range of practical skills
'Apprenticeship' – should be competent in a range of practical skills

**6. Familiarity with technical symbols**

TVEI: students who have done CDT, technology, or engineering focussed courses should be familiar. Those who have done Design Drawing (which is now a central 'core' of all GCSE Craft and Technology courses) will be fully competent up to and beyond the levels of even initial technician training.

CPVE: Engineering-focussed students who have done *preparatory* modules should be familiar

YTS: 'General' – possibly some basic familiarity
'Engineering' – should be familiar
'Apprenticeship' – should be familiar

**7. Measurement skills**

All trainees who have average or above average attainments in mathematics at school should have relevant measurement skills though they will not necessarily have experience of their industrial uses. (The ability to convert metric to imperial measurements is frequently quoted as an 'industrial use' which it is particularly relevant for an engineering trainee to have due to variations in the design of engineering plant)

Mathematical attainments can also be displayed through the CPVE 'core' certificate of attainment and within the YTS core.

Students who have completed TVEI, CDT, technology or engineering focussed courses and CPVE engineering *preparatory* modules can be expected to have a more developed appreciation of the industrial uses of mathematics than other students.

It is clear from the above list that there are many basic areas of compatibility between the programmes, despite differences in the delivery style of each.

In looking at *how* progression might take place, the major factor seems to be the ability to assess and define the experiences which trainees have. Courses, schemes and attainments are by and large too variable to be able to predict in advance what any individual will have done.

Establishing what attainments are is possible in several ways:

1. informally, in interviews or discussions
2. using written summative profiles or records of achievements
3. using formal testing and assessment (may include practical skills tests)

**1. Interviews –**

can establish the areas of relevant experience, knowledge and skills, and can be used to probe and explore written information about the trainee.

**2. Profiles and records of achievement –**

can record attainments either in detail (including standards of competence, such as engineering tolerance levels) or more broadly. Many such records or profiles are already used within TVEI, CPVE and YTS eg. the CPVE preparatory module checklists and many locally devised frameworks. (Profiles need to be constructed and used with care, as there are currently many different forms used, some

formative – reflecting students' or trainees' development – some summative – reflecting endpoint attainments – and to be useful for specific bridging purposes it is important that records are used summatively, acknowledging the level of detail and skill specificity which they incorporate. Some profiles may incorporate records of industrially-relevant skills, for example, if these have been acquired; others may not.)

**3. Testing and assessment programmes –**

can be constructed using whatever training criteria are considered appropriate. Many practical engineering skills and testing mechanisms already exist eg. the EITB Craft Programme checklist. Information gained in interviews and profiles can help to focus more formal testing programmes of this sort.

Finally, perhaps the most important part of the assessment is that the information it produces should be used in constructing the training programme, with training centre equipment and staff able to accommodate flexible individualised learning programmes.

To illustrate the ways in which assessments can be used to focus preparation and training programmes in different contexts, the following examples take five trainees entering the industry at different points, to show how their prior attainments can be carried forward to shape their experiences in employment and help them to develop in their new roles.

**Trainee Case Study 1**

**CPVE student to Occupational Training in Engineering**

Sharon gained a single 'O' level, in English, and three good CSEs in Physics, History and Art from her Secondary School in Essex. Maths and Geography had been among her strongest subjects at school, but she had had disappointingly low grades in each. Although she had little idea of what career she wanted, she decided to take both again, knowing that Maths in particular was important in most jobs.

The careers teacher at school had agreed, but suggested she think also about future careers and perhaps consider a new course called CPVE, which would involve spending two days a week in the local FE College. Sharon agreed to give some thought to what sort of CPVE course she might want to follow: she had been very interested in a talk given in school by a local engineering company, but because she had never followed a 'technology' subject at school did not have the confidence to explore the possibility of entering engineering work. CPVE would allow her to 'try it out', it seemed.

Sharon embarked on an engineering-focussed CPVE programme alongside her 'retakes'. She stayed at school for Maths and Geography and for CPVE 'core' modules in 'Science and Technology' and 'Information Technology'. In the college, she took a Production Services Introductory module based on parts of the City and Guilds Engineering Level 1 course,the '201'. She particularly enjoyed the college work and in the second term carried on with the 201, doing practical assignments which were combined with a three week work placement at Starkey's, the local firm who had given the talk Sharon remembered at her school.

The college advised her to take the City and Guilds Level 1 Certificate, and suggested she spoke to the personnel officer at Starkey's about some engineering craft traineeships which she had seen advertised in the local paper.

Sharon was formally interviewed by the Starkey's personnel officer. He knew little about CPVE, but she had impressed the staff during her work experience weeks, and he was pleasantly surprised to hear that CPVE enabled her to take a City and Guilds Certificate that year. Sharon also gave him a copy of a profile which made it clear that she had a lot of useful practical experience gained in the college skills centre, and in conversation she came across as knowledgeable and enthusiastic.

The training supervisor at Starkey's Training Centre interviewed her next, and asked her to do some practical tasks on the machines.

Starkey's made her an offer of a traineeship straightaway, though emphasising that she did have to improve her CSE grade in Maths, even if it meant taking it again the following year. As she seemed to have covered much of the standard initial training she was asked to go back to the centre for a detailed skills assessment. They found that she was already competent in almost all of the EITB Parts 1 and 2 checklist areas, though she had done little electrical work as yet.

Starkey's approached the college to do a short 'top up' in electrical work, and then made internal arrangements for her to do a condensed course in Machining to EITB Part 3 standards in the Company Centre over the summer months. When it was complete she joined the Starkey's second year trainees for module segment training and carried on with City and Guilds Level II work day release in the college. A good CSE grade in Maths made further retakes unnecessary.

**Trainee Case Study 2**

**YTS Engineering to YTS training in employment**

Katherine had two good CSEs in Maths and Physics, had done well in Design and Realisation and enjoyed the electronics part of her course. On leaving school she had applied for a traineeship in the largest engineering firm in the area, where she thought she might have a chance of being taken on as an apprentice. She was interviewed for an apprenticeship vacancy, but did not get it: the recruitment programme had been cut dramatically from the previous year and in the end only one trainee was taken on.

However, they offered her the chance of a YTS traineeship based in their workshops and covering some of the same ground, though they explained that they would probably not be able to employ her in the company at the end of the scheme. The scheme had a good reputation locally for finding jobs for its trainees elsewhere at the end of their YTS, so Katherine accepted, as it seemed to be a way into the type of training and work she ultimately wanted to do.

Work at the Centre began with a short induction and assessment course, where Katherine was able to discuss with scheme supervisors some of the things she had done at school: as a result she brought in some examples of project work from her Design Course and explained what it had involved. Some parts of this initial period also took place at the local college – a personal effectiveness module and some information technology, for example.

The rest of the initial year was taken up with three alternating 8 week blocks of on- and off-the-job training, all in the centre. In the work-based on-the-job periods, Katherine worked with other trainees in the design and construction of mobility aids for handicapped children. During the off-the-job period local college tutors worked with the supervisors on an integrated City and Guilds/EITB programme, covering the initial parts of the City and Guilds 201 and the Training Board's Craft programme to recognised standards.

Katherine gained some exemptions from the EITB programme for the work she had done at school, and completed 'Parts 1 and 2' quite quickly, so that more time was available for her to do the City and Guilds work within her programme. At the end of the year, she had completed much of the course, and had developed some of the on-the-job project work done in the centre within a related City and Guilds project – constructing a lift for a particular child at the nearby day centre for the handicapped.

At the end of the first YTS year, Katherine saw a job advertised in her local paper for a trainee with some experience and she went to see the company to find out more about it. They were very impressed with her knowledge and experience and asked if they could contact the training centre for a reference.

The Centre's supervisors had a full training profile of Katherine's work, and the company's staff studied this carefully at the Centre, discussing how her second year of training could develop. A job offer was made, and an EITB Part 3 in Fabrication and Welding with further City and Guilds work was agreed as the second year YTS off-the-job component. This was to be undertaken at the Centre, with the remaining work-based training to be undertaken in the new company, leading to EITB and City and Guilds certification at the end of the second year.

Katherine accepted the offer, and progressed into her new employment immediately.

**TRAINEE CASE STUDY 3**

**YTS 'General' to YTS 'Engineering'**

Darren joined a YTS Course without having any firm commitment to a job, and was placed by his managing agent with three companies during his first year. One Company manufactured machine tools, and here Darren's placement was in the stores. During his off-the-job periods, he gained YTS certification in all core areas, and developed familiarity with health and safety at work and computing technology which linked in to his on-the-job placement.

In the company, he became familiar with their products and with the departments and their activities and he developed a good relationship with the departmental staff. Towards the end of his placement, a job became vacant elsewhere in the company for a capstan operator, and Darren was invited to apply. The job had a training period which incorporated a company-devised programme and parts of a 'YTS Engineering' programme, though Darren now became a company employee.

The training period was roughly divided into three: initially, focussing on industry and in-company knowledge; then on workshop practices and basic skills; then on the specific skills needed to operate each of the machines at the plant. Each person's training programme was individually devised, and the company considered Darren's prior experience in the company as at least equivalent to the in-company and industrial induction, and overlapping substantially with the workshop practices.

As a result, Darren's training programme was able to concentrate on developing a wider range of basic skills to a greater depth, and Darren became competent to craft recognised levels. His basic familiarity with computers, developed within his first year of YTS, was something which his new employer was

particularly interested in, as a range of new CNC equipment had just been purchased, and there were plans for major retraining for all staff on the new machines. Through talking to Darren and arranging for him to spend some time on the new machinery with its specially designated training staff, an individualised programme was developed, building on his interests and knowledge, and complementing further off-the-job experience in the company's training centre.

**Trainee Case Study 4**
**TVEI to Engineering Training**

Robin lived in an area where there was an expanding electronics industry, and had developed an interest in electronics from an early age. During his third year at secondary school, a TVEI 'circus' of Technology and Vocational 'taster' courses persuaded him that he wanted to do a Modular Technology 'O' level within TVEI, combined with 'O' levels in Maths, English, Physics and Geography. The TVEI 'core' also contained computer awareness and 'World of Work' modules.

Robin enjoyed the TVEI course which included work experience in a large electronics company, and visits to other local industries, as well as a residential course; some part of the practical work within 'Modular Technology' and 'computer awareness' were also undertaken at a further education college with which the school had a TVEI link.

After two years, he gained 4 'O' levels, including a very good grade within Modular Technology. He was keen to gain a traineeship, and applied for a number of places within the area, including one in the company where he had done his work experience. He was interviewed for a place at this company – an employed traineeship within their Youth Training Scheme, consisting of one years full-time BTEC Level II work within the FE college, and a second year based largely in the company, moving around between departments.

At the interview, he impressed them by producing a portfolio of project work, and a full profile, detailing all the areas in which he had worked both within the TVEI core and within the 'O' level. This gave enough detail for the interviewing team to be able to ask Robin to explain his interests and achievements and they were surprised at how well he could communicate his enthusiasm and knowledge about the work he had done.

They also realised that he had experience in areas covered within some of the BTEC units, and particularly alerted the college where he would undertake training that they should find out what he had done and, when exemptions had been decided, consider with the company how it could be related to the next training stage.

Robin was offered and accepted the traineeship; he discussed his programme with the company trainers and college staff, using his profile and portfolio, and involving his school tutors and parents in agreeing a plan for future training.

He joined the company shortly afterwards, looking forward to his future employment, and already involved in planning his training programme.

**Trainee Case Study 5**
**TVEI at 18 into training within employment**

Stephen had joined TVEI at 16, after gaining 6 'good' 'O' level GCEs with a science bias. He had discussed his options with careers guidance staff and staff at his school, and had found it difficult to decide whether to look for a job which would give him a technical training, or whether to take a full-time Further Education course. He had decided initially to go for a Further Education course, as he thought it would help him develop his interest in Law, which he particularly wanted to take at 'A' level, and which school and college staff had suggested he could take in parallel.

However, a new Schools Technology Centre had recently opened in the area, incorporating a TVEI Centre, and one of the staff at the school suggested to Stephen that they might discuss the Centre's TVEI 'enhancement' facilities and links with the college and industry before taking his final decision.

At the centre, he was very impressed with the new equipment, and discussed the possibility of a joint 'A' level/BTEC course, which would involve his being based at school for another two years to take 'A' levels in Physics and Law, combining it with BTEC Units in Engineering Drawing and Manufacturing Technology at the local college. Within TVEI, it seemed that this was possible.

Stephen started his new course, and found that through the College and the Centre he was also learning a lot about local industry, visiting several companies and undertaking a work experience period in one company which had just installed a range of new equipment which was of particular interest to Stephen.

The company had quickly found that Stephen had a systematic approach to technical problems, and had the qualities they were seeking in their new recruits.

They were looking for technician apprentices, to combine diagnostic and maintenance work across the mechanical/electrical/electronic specialisms, and they needed people who were adaptable, good at fault-finding and able to operate independently. Their selection procedures for 16–19 year olds were rigorous, but they felt that Stephen had a good chance and they suggested he applied for one of the four-year apprenticeships.

During his second year of TVEI he undertook their interviews and tests, and was accepted.

Their training consisted of two-years initially in the college, taking company-devised and standard BTEC units to an individualised programme, followed by two years in company.

## PART III

## CONFERENCE FEEDBACK AND RECOMMENDATIONS

As the major dissemination activity for the 'Progression into Engineering' project, a conference was organised.

The aim of this conference was to provide the opportunity for those from industry, training and education to meet and discuss ways of linking school, college and work-based programmes. It was hoped that through discussion the conference delegates would focus on ways of linking and co-ordinating programmes in engineering to maximise experience, skills and knowledge, and decide on the most appropriate ways of putting them into effect.

The conference consisted of presentation and information sessions, and, through workshops, opportunities to discuss the issues. The format was:

| | |
|---|---|
| **Introduction & Welcome** | Dr Karen Evans, Project Director |
| **Keynote Speech (see p. 7 for summary text)** | Mr Mike Ridley, National Council for Vocational Qualifications |
| **The Research** | Keith May, MSC<br>Karen Evans, University of Surrey<br>Jan Shepherd, University of Surrey<br>Veda Dovaston, University of Surrey |

**Workshop 1**
- Information – to provide the opportunity for delegates to update themselves on one of the initiatives TVEI, CPVE, YTS and FE Provision.

**Workshop 2**
- Discussion. What is the feasibility of bridging?

**Workshop 3**
- To consider the Research recommendations
- To suggest ways forward
- To formulate questions for the panel session.

**Report back and Panel Session.**

### DISCUSSION GROUPS' FEEDBACK

The conference provided opportunities for workshops to discuss issues raised by the research. These groups considered the feasibility of bridging and examined the recommendations from the research. The following are the results of these discussions as reported from the groups:

#### Bridging, is it feasible?

The conference delegates very strongly supported bridging but raised a number of issues relating to its implementation. It was felt that bridging relies heavily on effective communication between those involved in education and training. For bridging to be successful there needs to be meaningful communication between schools, colleges and industry.

The central issue was seen as transferability. Broad experiences in engineering were seen as transferable but skills could be transferable, depending on a clear understanding of what was understood by those skills. One problem seems to arise due to the labelling of skills, young people tending to relate to the label rather than considering the skill itself.

The possibility of bridging lies with flexibility of schemes. The new schemes, C&G 201, BTEC and EITB, are producing material which could provide opportunity to bridge. One of the barriers to this seems to be the age barrier, when young people at 17, having followed a CPVE course or one year YTS for example, have encountered difficulty when applying for an engineering training course. This situation also exists at 18 years old.

Recent developments towards a unit structure to engineering training and records of achievement have resulted from discussions between EITB and MSC and these may provide the answer to bridging.

#### Initial Assessment

If the unit structure to engineering training were established it could form the basis for assessment. Two approaches to initial assessment were suggested:

1. half to 1 day's assessment could establish a young person's competency.
2. The trainee could embark on the existing training programme and those who have prior experience could be identified and progressed faster through the training.

**Increased School : Industry Liaison**

There was unanimous agreement at the conference that there should be increased school : industry liaison. It was felt vital that this must be two way as there appears to be a mismatch of perceptions. The individuals who are most important in this process are the teacher of courses and the recruiter in industry, each having the opportunity to visit one another's establishment. Industry, it was felt, must articulate its needs, and communicate this to schools. A structure should be established for the involvement of industry in schools, avoiding the links occurring solely through panels: active participation rather than just discussion. Concern was expressed relating to the expense to the small employer of participation in industry links work.

A co-ordinated structured approach is also needed within local authorities for Work Experience programmes especially with the increasing demand for placements.

**Profiling**

This provides a tool for bridging. A problem lies in the language of profiles produced by educationalists, and this creates a communication gap. Efforts must be made to establish a common language.

**Local Progression Working Groups**

It was felt by some delegates that this title implied a formal structure whereas informal local groups of enthusiastic individuals work best. One of the outcomes of the conference, it was hoped, would be the establishment of such groups, which could work more effectively than national groups as they relate to the local situation.

**Increased Publicity**

The unanimous reaction of the conference was that publicity is essential particularly now with the introduction of new courses: GCSE, TVEI, CPVE, BTEC and C&G. Employers have used 'O' level in the past as an indicator, and now need guidelines on a 'standard' to which they can relate when recruiting young people.

**Questions**

The following questions were raised in the discussion groups and considered central to the establishment of bridging and progression issues in general.

- How can we overcome competition between provider institutions for pre-vocational and vocational provision?
- How can arrangements be made to cope with the retraining of staff which is necessary for assessment of industrial competencies?
- Why does engineering not attract bright young people?
- Where does CPVE fit in? Does it increase young people's opportunities? What is its future?
- Does CPVE develop skills which industry needs?
- Is there any evidence to suggest that CPVE is helping to ensure that more females become engineers?
- How can the age barriers for entry into engineering from CPVE and YTS be overcome?
- How can the increased demand for Work Experience placements be met?
- In view of the financial constraints on education, how can education afford to take the initiative in school : industry links?
- How committed is the EITB to establishing bridges into engineering?

**RESEARCH RECOMMENDATIONS**

**Module or Course Content**

Modules or courses which form an introduction to engineering, and which could provide the basis for later specialisation, could play a vital role in creating a realistic picture of the industry and the skills involved in engineering. It is recommended that such courses contain the following components:

- basic knowledge of the industry
- familiarity with tools, machines and materials
- basic practical engineering skills to stated levels of competence
- technical communication skills and familiarity with technical symbols
- basic measurement skills
- industry-wide safety procedures

These modules could be used

- within TVEI pre- or post-16
- as an introductory module within CPVE
- as an off-the-job YTS Engineering alternative

– as the broadly-based initial training component of industrial programmes to complement specialised skills training (specifically relevant in many operator schemes).
– to top up students or trainees with little previous experience at any point.

Alternatively a set of baseline attainment levels compatible with these components could be used to measure skills and attainments, however gained. This would be particularly relevant within YTS and occupational training, where work-based learning and opportunities for off-the-job learning are combined.

**Industry's Input into Courses**

Continued efforts should be made to increase school-industry liaison. Industry should be encouraged to make an input into school courses to give the industrial perspective. Employers' involvement in the development of profiles and records of achievement will ensure these records will be of direct relevance to industry's needs when recruiting.

**Assessment and Profiling**

1. All types of courses, whether conducted within a TVEI, CPVE or YTS framework should provide the student with a profile or record of achievement, including where appropriate reference to specific engineering skills. Work experience periods should be closely monitored and appropriate records kept. It is particularly important that profiles and records are readily understandable to all parties within the education and training process, and that they are *used* when the student/trainee transfers from one institution to another.
2. Guidance may need to be given to students/trainees and staff in schools, colleges and training schemes to ensure that records are kept and used appropriately.
3. Relevant initial assessments should always be conducted on entry to an engineering training centre. Where records and profiles are available, these may be used to focus the assessment programme.

**Progression**

1. Mechanisms are necessary to support liaison between FE colleges, schools and employers on a local basis, particularly to ensure smooth transition between school and work or college courses. The creation of progression working groups might help to facilitate the development of clear progression routes and prevent 'overlap'.
2. Industry should be encouraged to recruit school leavers regardless of age, despite former practices of recruiting only at 16, to accommodate the increasing numbers of students following pre-vocational courses such as TVEI and CPVE at 16+.

**Publicity**

1. The introduction of new initiatives in education and training should be accompanied by an extensive publicity campaign.
2. Engineering often has a poor image among young people as a career destination. Industrial and engineering staff could help to improve its image by becoming actively involved in schools.

## WAYS FORWARD

When considering the ways to proceed when implementing bridging arrangements within education and training routes in engineering, the following recommendations have been suggested. These have resulted from individual reactions during the course of the research, and the suggestions made during dissemination activities principally through the conference and responses to the conference evaluation questionnaire.

**Schools – College – Industry Liaison**

Great emphasis has been placed on the need for increased liaison between those involved in the educational and training programmes which contribute to a career in engineering. The industry's participation in this is seen as vital in order than their attitudes and training needs can be taken into account, and also to increase industry's knowledge of the new education initiatives. This awareness of new developments in education is particularly important as the programmes are increasingly preparing young people for the world of work and enabling them to acquire engineering-relevant skills and experience. The development of these skills will be of value to employers as they provide a prospective employee with a broad background to the industry and the ability to respond flexibly within the work environment – especially important in the present changing state of the engineering industry.

The establishment of local working groups is seen as the way of increasing liaison between industry and education. It is reported that these exist in some areas of the country but the extension of the network throughout the country is essential. It is felt that the contributions from industry need to be

centrally co-ordinated and clearly targeted. With the increased demand for work experience placements in industry this co-ordinated approach is essential. It is suggested that it is necessary to explore further imaginative ways of providing work experience to alleviate the pressure on industry.

**Programme Content**

It is hoped that with increased liaison pre-vocational programmes will provide further industrial-relevant content and the progression from one stage to the next will be smoother, and duplication, which can be demotivating, can be avoided. Thus the experiences and skills acquired by young people can be built upon as they progress into a career in engineering. This may lead to an accelerated training programme which will prove advantageous to the industry. The work of the National Council for Vocational Qualifications (NCVQ) in rationalising the provision in vocational routes will be central in aiding the clarification of progression routes. Concern has frequently been expressed relating to the role of CPVE, and it is hoped that the NCVQ recommendation will contribute to solving this.

Any further training programme in engineering could take into account skills which have been attained by young people. Existing training programmes are arranged in a modular format. Once having established the competency of trainees, a programme of 'top up' modules for each individual trainee could be developed thus maximising their previous attainments.

**Profiles**

Profiles and records of achievement are being developed as a way of recording a student's skills in such programmes as TVEI, CPVE and YTS. This could provide the ideal vehicle for recording young people's attainments and competency in engineering-related skills which could be used when designing the individual training programmes as described above. There have been some criticism of the profile documents produced so far relating to their lengthy, generalised nature, however they are still in the process of evolution and contributions from employers would be welcomed and would aid the effectiveness of the final document.

# PART IV
# PERSPECTIVES

## EMPLOYER ATTITUDES

The employers approached in the research had clear ideas about the sort of youngster they want to recruit: at all levels, the first requirement was for motivation, enthusiasm and a positive attitude, followed by basic mathematical and communication skills. The employers varied in the value which they placed on formal academic qualifications with differences often based apparently on personal preference and past experience.

Overall, however, most employers did take into account attainment in CSEs and 'O' levels, and had 'rules of thumb' about necessary levels of attainment, with many doing their own formal testing, especially in mathematics, in an attempt to predict likely attainment. Most employers, however, did not expect youngsters to have specific engineering skills, seeing these rather as a bonus, and few did any practical skills testing as part of their selection process.

Concerns within the industry seem to centre around the difficulties of recruiting 'good' trainees into mechanical engineering (particularly at craft level), academically able trainees into technician jobs and girls into the industry as a whole.

These concerns were brought out by many of the employers approached:

> 'Despite the growth in technology there are vast shortages within the areas of Engineering Craftsmen (Machine Operators, Electronic Assembly Workers etc.) and also Technicians. These shortages are becoming increasingly difficult to resource because of the decline in the popularity of Engineering as a career, with many of those wishing to follow engineering moving towards Computing and Software Engineering'. (Training Officer in a large national company.)

> 'Electronics personnel are scarce at all levels as are any personnel with computing skills. This shortage is particularly acute at Technician level (ie. those undertaking TEC National and Higher National Certificates) and results in many graduates undertaking technician level jobs. We also experience difficulty in attracting young people to enter Craft Apprenticeship schemes because even skilled craftspeople are held in low esteem. Many of the jobs we have to offer involve both practical and mental skills and command considerably higher pay than the routine office jobs that follow our shorter clerical training schemes (same entry requirements). This is true of sites only in the South of England and as one might expect all our Northern sites have many times the number of applicants to job opportunities . . . As an additional comment we suffer a shortage of female engineering applicants . . . ' (Development and Training Manager in a large nationalised company.)

Employers seemed not to be universally in favour of a heavily focussed vocational curriculum, though with any vocationally relevant skills being valued, and any training exemptions which these might represent welcomed if bringing genuine savings of time and resources. However, there is an often-expressed concern that they should not be gained at the expense of 'basic' skills and understanding: frequently these 'basics' are seen in terms of the '3 Rs', but often a wider perspective is adopted:

> 'Examination results are a useful marker in particular because entry to further and higher education largely rests on them. However the key qualities we are looking for are
> – analytical problem-solving skills
> – ability to learn and adapt
> – inquisitiveness
> – reliability
> – ability to fit into a team
> – ability to accept responsibility (for one's work and the progress of one's training)
> – observation, listening and communication skills
>
> These qualities are perhaps drawn out at school not by the subjects themselves but by their interaction and by the teaching approach'. (Training Manager)

One training officer commented: 'The engineering industry should see any vocationally based course as being a positive step forward within education. However the question does still arise as to how effective they are in their present format'. There is some feeling that schools *ought* to steer clear of specific training-style activities: school resources are not seen as adequate or appropriate; teachers are seen as lacking industrial experience; the teacher shortage in technology is acknowledged and schools, it is felt, cannot realistically keep up with the rate of industrial change. One Manager commented:

> 'With the ever increasing rate of change of technologies and hence skills required it would be a very responsive and fast-moving education system that could turn out the required skilled workforce in the correct numbers to meet changing demands'.

Other comments ranged from:

'Staffing levels and the areas of teacher competence are currently insufficient to offer effective teaching.'

to:

'vast amounts of money are being spent within the schools in an attempt to offer up-to-date technology for pupils. This is especially true in the areas of CNC machines, CAD/CAM and Information Technology . . . Much of what they are learning is outside of the scope of industrial requirements. It is true that modern technology students need to be aware of the capability of the modern equipment but they do not need to be masters of expensive training machines, bearing in mind that most if not all employers train to meet the requirements of their own organisation and equipment'.

There was almost universal agreement among the employers approached that more and better school-industry liaison was the main way to increase the relevance of the curriculum.

Training staff in many companies were already actively involved and made specific suggestions for improving liaison, including:

'– secondment of teachers to industry as a normal part of their career (say 1 term every 5 years).
– secondment of suitable engineers and business professionals into schools. (As advisers to teachers and to help teach.) This would be particularly appropriate in business studies and CDT.
– on a smaller scale engineers and business professionals seconded to teach particular lessons about which they have relevant knowledge.
– industrial members on education management committees – Board of Governors.
– industrial involvement and advice on subject curricula.
– teachers attending industrial management courses and vice versa.
– school students attending industrial management courses.
– work shadowing and work experience.' (Development and training manager)

Most employers, however, felt that links were at present inadequate, and a number of practical difficulties were quoted, including finding work placements, 'attitudes' (of both teachers and industrial personnel) and the expense and inconvenience of freeing staff for industrial tutoring. Underlying all of these specific reasons, however, there is often a general feeling that in present circumstances effective liaison is simply not realistic:

'I believe Industry and Education have yet, in many instances, to learn a common language. Some Education Authorities and teachers with which I have had dealings still see the links as a one way process. Money and visits will be accepted, but not advice.' (Training Manager.)

'At present much of the British Engineering Industry is not geared to offer reliable links with schools and colleges. School links are often seen as a burden on a company that may be facing high financial controls or staff shortages. Other organisations use these projects more as P.R. exercises rather than as a development programme for the pupils. In general most of industry does not take the task seriously, with much of the long term work being carried out by a small number of larger national companies, with on occasion a small organisation passing on small projects which they are unable to effectively carry out themselves due to time scale . . . Industry as a whole is far too complacent about the current situation, and needs to take a far more active role in supporting industry and education links.' (Training Officer.)

Despite this, recent educational innovations which involve industry more closely in school work are seen as genuine steps in the direction of better communication and understanding and are welcomed by and large. However, very wide variations were found between different employers' attitudes to school work and in particular to achievement in technology and craft areas. Some employers see school studies as having little relevance to training, and discount any practical work undertaken at school:

'For many years the British Engineering Industry has faced the problem of identifying a suitable baseline at which to commence industrial training, the result being that most employers are forced to assume that all of their trainees, be they YTS apprentices or graduates know nothing . . . As a result of the number of schools, colleges and regional examining bodies . . . it is impossible to identify a set of common standards.' (Training Officer.)

Sometimes, however, 'starting from scratch' is a clear and deliberate policy: where trainees' school attainments are few, they are sometimes seen as benefiting from the chance to 'start again' in a new environment. In selective schemes, on the other hand, where youngsters are recruited on the basis of school attainment levels, it is felt that many able youngsters would slip through the net if recruitment was restricted to those who had done 'relevant' courses are school: here school attainments are used largely as a filter.

Where practical skills have been acquired, industrial trainers often express reservations about their transferability: many employers will not consider a skill to be genuinely acquired unless the trainee has first undergone the relevant in-company safety training; others feel that a skill which has been acquired without reference to industrial standards of accuracy is in fact worse than no skill at all. In these cases, trainers consciously go 'back to zero'.

Usually, however, the value of some craft training is acknowledged as a useful foundation. The general view of most companies is probably summarised in the following quotation:

> 'While many of these courses have their shortcomings in terms of content and quality of teaching, they are generally helpful in that they provide students with a foundation of practical skills and technical knowledge upon which to build.
>
> Safety consciousness and experience of the real working environment is the most notable failing . . . (but) . . . the ability to read and understand technical drawings has been a positive factor in training.'

**Attitudes to TVEI**

Most employers have only limited experience of TVEI, but express cautious enthusiasm while witholding judgements in many cases until they have taken on 'TVEI' trainees. Most will at present offer exemptions only on the same basis as they would for CSE or GCE craft or technology attainments, with some concern expressed about the quality of school-based City and Guilds and BTEC courses, which are frequently a central component of TVEI courses:

> 'I do know that many of my Training Manager colleagues do not believe that C&G or TEC or BTEC courses should be taken at school as they have said that schools do not offer the same learning environment as industry and college.'
>
> (Employers are even reported as asking TVEI students for 'translations' of City and Guilds certificates into CSE grades before offering them a training place!)

As familiarity with the scheme increases, however, these reservations seem to diminish.

There is expressed concern that TVEI is an option for low attainers:

> 'Most industrialists are impressed with TVEI and the new interactive approach implicit in TVEI schools, but it would be fair to say that as TVEI is in relative infancy and apparently has some strong opponents from within Education, there is some degree of caution.
>
> There is a danger that it could become the route for low achievers rather than all levels of ability and I have sat at meetings where Headteachers have said that 'A' level students could never consider the 16–18 TVEI route and the brightest 'O' level students would be discouraged.'

Difficulties in establishing 'standards' are seen as even greater for TVEI than for GCE and CSE courses, due to variations from school to school and district to district, and this is also frequently cited as a reason for witholding judgement until the scheme has had a chance to develop.

Overall, however, TVEI seemed to have been well received by the engineering trainers approached in this research. Despite unfamiliarity and newness, nearly half of the twenty-three employers in our study who were recruiting in TVEI areas were either actively involved in TVEI (6 employers), or were at least familiar with it (5 employers). No less than eight saw the potential for agreed exemptions from TVEI into their training programmes, whether on an individual or group basis.

While the schemes which contributed to the research were not randomly selected, there is no reason to think that they are not in a general sense reflective of attitudes amongst this type of employer nationally (bearing in mind that our research tended to focus on larger organisations with *established* training programmes). This level of involvement at a relatively early stage in TVEI's evolution can only be seen as encouraging.

**Attitudes to CPVE**

Few employers in the study as yet held firm views on CPVE or had experience of the course which possibly reflects both its recent introduction and the predominance of non-technological courses within the framework. Many employers were in fact quite unfamiliar with it when asked for their views; when the CPVE framework was described the most common response was concern that the age requirements would inhibit recruitment into the industry.

Where interest was expressed it was in the context of developing joint CPVE and YTS provision within a group training centre.

In this particular area, it can only be concluded that as yet CPVE has to make its impact on the types of engineering training organisations covered by this research, though this is undoubtedly an area in which further work needs to be done when the courses are more established.

## COLLEGE ATTITUDES

### The Youth Training Scheme

It is hard to exaggerate the impact made on college staff by the introduction and extension of YTS. New demands have been made on the curriculum, and contact made with a wider range of employers and students, often through the mediation of an external Managing Agent who has responsibility for monitoring college provision. In addition, they are increasingly facing competition for the YTS places they provide:

> 'increasingly, schemes are providing their own off-the-job training or arranging it with training enterprises outside the FE system . . . FE colleges are being rejected for their alleged inability to deliver what is needed in YTS, or in some cases to offer it at a reasonable price.'

When asked to assess the specific impact of YTS on the college and on college staff, the most common observation is that colleges have had to adapt to a much wider range of students.

The range of trainees will inevitably reflect the different types of YTS schemes. Some trainees will be very similar – in terms of level of school attainments, motivation and job status – to the day-release apprenticeship trainees with whom many lecturers were most familiar before the introduction of YTS. Other trainees, however, are seen as less committed and less motivated, especially where they do not have 'employed' status within the scheme. (In one course in a skill shortage area where almost all YTS trainees were recruited on to apprenticeships, an engineering lecturer commented that the 'general attitude that you would be better on the dole' overrode in some cases a realistic appraisal of employment chances). One college lecturer commented that:

> 'some YTS trainees lose their motivation half way through their course because they find they don't like engineering'.

College staff also occasionally express concerns about the suitability of YTS trainees for specific FE courses.

Most colleges have responded to the anxieties of their staff with YTS-focussed staff development initiatives.

> '. . . the attitude of teaching staff is particularly important, and in some colleges great efforts (are) required to motivate staff into getting enthusiastic about, or becoming involved in, YTS work. In some colleges promotions to Lii were required to attract teachers into taking on YTS responsibilities (eg. course tutorships). YTS is still seen as low level work.'

Increased attention to initial vocational counselling for trainees is also seen as important, to ensure that they do not 'lose interest'. The open entry policy of many courses and schemes brings with it changes of approach within vocational guidance, for:

> 'Although the college may go through a procedure of interviewing/selection, what is really going on is the selection, based on current qualifications, of the most appropriate course for the student's abilities/aspirations and not a competitive selection of students'. (Deputy Head of Department.)

Individual college lecturers in engineering also express specific worries about the content of YTS programmes. A lecturer in an area of high unemployment drew out both practical and policy implications:

> 'A fairly in-depth knowledge of a certain skill (electric – mechanical – pipework etc) is in my view essential before branching out. Why? Well the YTS trainee on a part-time course in a FE College will not accept that he is, say, a trainee welder or plumber all week apart from the day he attends college where he is a joiner, painter, fitter, bricklayer, mechanic or some combination . . . a young person who is going into a skill area needs a base, an initial trade or technician training . . . My point is this – are we (the MSC and FE) really contributing to the reconstruction of the manufacturing society by the sectionalism and consequent minimising of skills?'

Another lecturer, in the South East, commented:

> 'Bearing in mind the relatively low youth unemployment rate in the south East YTS is an exclusively craft student level phenomenon. The advent of YTS, or NTI in its early days, has resulted in the virtual destruction of first year craft courses, and now second year craft as well, and their replacement by YTS. The major problem is that YTS is a shorter course than the 1st year craft and the curriculum differs slightly, so it is difficult to get the students up to Part I standard, as desired by fostering/potential employers, in the time available.'

The same lecturer went on:

> 'The other bone of contention is that the MSC keep on changing the system/rules so that the courses never have time to stabilise enough for staff to concentrate on developing/refining appropriate teaching styles/techniques and when the rules change insufficient time is allowed for considered curriculum development.'

College staff perhaps inevitably feel more confident about the quality of on-the-job learning where the college itself is the managing agent and is able to monitor the placements. The level of monitoring

nonetheless varies, which may mirror skill shortages and surpluses in the area. Where there are shortages, the 'matching' of a trainee to a job placement may be done with great attention to his or her aptitudes or needs, and employment offers will be expected to follow. In contrast, managing agents in areas of high unemployment may be pleased to get enough relevant placements for any given group, with the result that standards of monitoring are often seen as less stringent.

In discussing the impact of YTS with college staff, few minimise the difficulties and challenges with YTS initially brought with it for established lecturing staff. However, with the growth of staff development programmes and of the YTS framework itself, wider benefits to the college are becoming increasingly apparent. As one lecturer concluded:

> 'We enjoy a greater degree of consultation with firms, students and each other than was the case before YTS.'

**CPVE**

The attitudes of college staff involved in CPVE vary almost as much as the types of course offered. In looking at CPVE as a whole during its first year some general impressions come across, however: a sense of hasty course construction is one such impression; uncertainty about the future is another. One lecturer summed up this feeling of 'learning as you go along':

> 'With little in the way of additional time, staff have come a long way in responding to . . . CPVE, but it has usually been response 'on the run'. Complete schemes have been mounted in as little as a fortnight, attempts have been made to introduce more participative, experiential and integrated methods and materials . . . '

With engineering-related courses this feeling is perhaps even more marked than elsewhere, as courses within the Technical and Production vocational categories have not been widely established.

Most engineering work within CPVE is undertaken either exclusively in colleges or in college/school consortia, (largely because of college access to more technical workshops and equipment) but some schools and sixth form colleges run their own courses, increasingly within the TVEI framework. School provision, however, tends to be seen by colleges as leading to difficulties when students progress:

> 'Some school CPVE students are coming to the college and having to be 'topped up' with extra City and Guilds and BTEC work to progress into, say, BTEC National. So they are joining college CPVE classes, effectively doing CPVE for a second year. Schools could help by providing very detailed profiles along with good examples of students' work.'

Communication with the consortia schools is a major concern also, and college staff occasionally quote examples of basic communications breakdowns: colleges may not know when school holidays or work experience blocks interrupt the programme; or may not be informed of changes to the schools' programme. (Schools also make very similar complaints about communications with colleges in practice!)

Where communications are good at all levels, not just at co-ordinator level, the scheme seems to benefit.

One CPVE co-ordinator summarised his view that school-college co-operation would improve as a result:

> 'It is through personal contact that understanding occurs. Opportunities for lecturers and teachers to meet are essential. Incentives for meeting? Possibly the necessity for curriculum development in areas of CPVE and TVEI will provide these opportunities.'

Exclusively college-based schemes are very varied, and few generalisations are possible. Many of the students have a basic vocational commitment, with some being fully committed to their career choice, and in this style of scheme concerns are expressed about the development of other competing provision:

> 'The new BTEC First Award in Engineering clearly competes with the CPVE provision, and may see CPVE decline in take-up significantly . . . The end result may be that CPVE becomes a lower-ability course, or for the less committed, leading into First Award. There seems to be a confusion about the respective roles of the two courses.'

The future of CPVE is a concern, however, in all types of schemes, including those which focus more on the 'taster' role of CPVE, where it is assumed that students will be the vocationally uncommitted. Some students here are encouraged to do CPVE by the need to retake school exams.

> 'At 16, a trainee with a real commitment to engineering would do best to go for a good YTS traineeship or traditional apprenticeship or do a full-time FE course. However, there are youngsters who 'need an extra year at school'. And there are genuine reasons for wanting to do up to 3 'O's – so many schools do a combined CPVE/'O' package.

In the consortium scheme referred to in this quote, the CPVE course had been designed around the college's experience of co-operating with 12 local schools to teach City and Guilds 365. The CPVE students, it was felt, were:

'older, on average of higher ability (if they are combining 'O' level retakes) and willing to stay on at school – therefore generally better motivated and better behaved'.

College lecturers, however, in general seem to have mixed feelings about the need for a 'taster' year. On the one hand, CPVE was seen as a better option than YTS for trainees who might start vocationally-focussed work and then change their mind half way through. On the other, there was concern that, if seen as purely a 'taster' year CPVE might become associated with the group

'who don't know where they're going and nobody knows what to do with'.

At present, CPVE is (perhaps inevitably, given the recency of its introduction) seen as having little vocational currency outside the specific qualifications gained within the City and Guilds and BTEC components of the exploratory and preparatory vocational modules. Where preparatory work is not attempted, assumptions about CPVE students already tend to be negative:

'CPVE lacks credibility at the moment and there are no plans to develop college-based courses because there are strong YTS courses which they would only duplicate. Student quality is a main concern too, as the lower ability don't go into engineering, and we are not equipped to teach for special educational needs in those areas.'

'A year is rather a long time for a person to decide where they are going.'

Those who do remain within CPVE might be seen by employers as taking 'time out', gaining 'only a basic familiarity with vocational skills which might help them in an interview'. Uncertainties about progression from CPVE to other types of further education, and about its acceptability within the new NCVQ framework are perhaps contributing to these concerns.

This rather negative view of how CPVE might develop is nonetheless balanced by much basic enthusiasm for the framework itself. In one college, which had wholeheartedly redesigned all its existing foundation courses in line with the framework guidelines, the engineering staff, 'at first sceptical' about the policy decision to adopt CPVE had developed new courses which convinced them that 'the negotiated integrated style *is* a valid way to teach engineering skills'. The view expressed by the CPVE co-ordinator in this college, (in an area of high youth unemployment) was that:

'The conventional engineering courses will need to change to accommodate new learner-centred styles. They remain satisfactory if jobs are available at the end. CPVE, however, fits students for a more uncertain future, in which they may be doing electronic, electrical or vehicle maintenance work, for instance'.

The sometimes sharply contrasting views about CPVE expressed by college staff are perhaps indicative of the way in which CPVE can be adapted to different contexts. Its student-centred framework can reflect different local employment possibilities, and accommodate a range of student ability levels:

'The essence of CPVE is that each course has relevance to the local situation'.

**TEACHERS' ATTITUDES**

Teachers in Craft Design Technology departments in schools appear to be adapting to new technologies and are concentrating less on the traditional craft skills. There are still, however, woodwork and metalwork teachers who put great store by those skills, though the new breed of technology teachers see their role as providing their pupils with a broad view of technology and engineering, and experience of a wide range of materials and equipment. This change in approach is illustrated by a technology teacher:

'. . . the exam taken should be design-based and not traditional Woodwork or Metalwork. The grade achieved should give a measure of the candidate's aptitude for a future in Engineering . . . success in these exams should not be seen as a measure of skill in handling tools and equipment'.

Many teachers saw their role as encouraging pupils to develop problem solving and design abilities rather than specific engineering skills which they feel is the domain of specialist trainers. This view was expressed by the Head of Technology in a comprehensive school.

'The primary function of any school-based course whether it be 8–12, 12–16 or 16–18 must provide the young person with a structured approach to logical thinking and an insight into problem solving. It is *not* the function of any course to train specifically for any branch of (engineering) . . . I prefer to encourage young people to think more in terms of designing, evaluating and analytical skills'.

This view of technology in schools as the foundation to a career in engineering rather than specific skill training was echoed by other teachers:

'(I see) GCE and GCSE courses over the whole field of CDT as merely general preparation for careers in Engineering rather than specific training'.

and

'There is no real attempt in schools to train pupils for a specific career. Industry is able to do that much better as they have better resources, facilities and knowledge of specific requirements. They

will also have more up-to-date equipment and be familiar with the newest processes. Schools do not have the resources needed to update equipment or experiment with new processes . . . Industry could help much more with keeping teachers up to date'.

On the whole technology and engineering has had a poor image which has been reflected in its status in schools. Craft courses have been considered better suited to less able students, who are thought to be 'better with their hands'. The assumptions which separate practical and academic aptitudes still exist. Thus in schools 'bright' students have not been encouraged to join technology courses which are seen as 'practical' but rather directed towards the sciences – which are considered 'academic'.

These attitudes and the physical separation of the science and technology departments within schools have meant that they tend to function as separate units. Links are however being forged especially through such areas as electronics and computing.

New initiatives in education particularly TVEI have had a marked effect on technology courses in schools. Teachers are often enthusiastic in their response to the new opportunities afforded by improved funding. Closer liaison with industry, and a greater appreciation of what employers require of young people leaving school have been identified as benefits. As expressed by one TVEI technology teacher:

'What I do say to employers . . . is that pupils involved in the initiative had experienced a different approach to education they have developed additional skills in problem-solving, personal and social development, an understanding of industry and commerce (non-job specific) through the experiential approach to the curriculum'.

One advisory teacher for TVEI technology is rather cautious in his claims for TVEI:

'My general feeling is that as yet TVEI has still to tackle the problems of industry and the needs of industry fully . . . However TVEI is producing a pupil with, perhaps, more flexibility in the work situation'.

With its stated commitment to equal opportunities TVEI, along with education as a whole, is attempting to encourage girls to join technology courses, and is attempting to develop strategies to enable girls to experience what is for them a male-dominated area of the curriculum.

CPVE and TVEI are improving contacts between school teachers and further education lecturers. Historically there has been competition between 6th forms in schools and FE colleges for students, which has mitigated against good communication. The development of consortia arrangements appears to be contributing towards greater understanding at the individual level, and aiding the development of progression routes between the two institutions.

**YOUNG PEOPLE'S ATTITUDES**

A range of Engineering trainees was interviewed to discover their experiences of engineering courses and the value of courses in school in preparing them for a career in engineering. They were also questioned about their reasons for choosing a career in engineering, and their experiences on application for engineering training including company recruitment techniques.

The overriding influence on young people when choosing an engineering career is the direct experience of family and friends. Other sources of information were careers teachers, careers evenings, careers officer, and one girl mentioned a Women into Science and Engineering (WISE) conference which convinced her that she wanted a career in engineering.

Students had experienced a wide variety of courses in school: CSE, GCE in Technology, CDT, Metalwork and Technical Drawing and C&G 686 were commonly mentioned whereas some students had not followed technology courses but instead Physics courses.

At 14 when choosing their courses, pupils tend to feel a pressure to opt for courses which they see as directly relevant to their future career if they are vocationally committed, whereas others who reach their decisions later tend to choose a broader based course.

TVEI, with its emphasis on courses relevant to the pupils' future and to the 'world of work' in general, has been chosen by pupils who feel that it will provide them with advantages and progress them faster towards their future career. As stated by one engineering trainee:

'I thought it was a good opportunity to do something towards my career'.

and another said:

'The course has meant quite a lot to me as it has helped me decide on a particular career.'

TVEI courses vary greatly in content but one area which has not hitherto been common in schools is electronics. In one TVEI scheme this has been very popular and has helped students to decide on a career in electronics. Girls who have followed the TVEI electronics course have been particularly enthusiastic:

'I wanted to do electronics and technical drawing which we had never had the chance to do before as we were at an all-girls school'

and

'I like to know how things work'.

These comments reflect that the equal opportunities policy in TVEI has strongly promoted the involvement of girls in technology courses, and the TVEI funding has provided the opportunity to develop technology in girls' schools.

The broader aspects of TVEI courses, for example industry links, work experience and problem solving approaches, have helped in a general way to provide an awareness of the 'world of work'. As one student says:

'It offered discussion, practical work and projects also it offered skills which are not done in school'.

At present there are few students who have progressed into engineering from CPVE courses, which on the whole are not seen as appropriate for the vocationally committed youngster. However, the courses have helped some students to clarify their ideas.

A number of TVEI and CPVE schemes have developed close links with colleges of FE, and engineering courses have been provided as part of these. Students have been particularly attracted by courses within colleges, and been motivated by the equipment available to them. A frequent remark is that college lecturers 'treat you like adults' and pupils have responded to the freer atmosphere. On the other hand there have been comments concerning the lecturers' approach, their tendency to separate theory and 'practical' and their lack of response to a younger audience:

'All we did in the lessons was copy notes from the overhead projector'

and

'The teachers at college should take things more slowly and talk to the class more and have more patience'.

One student felt that college courses could advance students along a career route.

'When pupils left school they could be granted exemptions if they follow a technical career. The subjects at school could hold back the pupil . . . the assessment programme is more representative than the old GCE and CSE exams and therefore pupils could benefit.'

When students were recruited on engineering courses, their perceptions were that there was a varied reaction to school courses but that on the whole employers and training managers tend to value traditional courses, qualifications such as GCE and CSE and carry out their own tests. These were commonly aptitude tests with practical tests only rarely being given. On the whole, ex-TVEI students found that most employers had only a very limited appreciation of TVEI:

'When I applied for my apprenticeship I found that many of the local and big well known companies in . . . did not know about TVEI, what it meant and what it involved.'

Trainees found that no exemptions were given for previous experience gained during school courses.

They found that school courses provided familiarisation with equipment, but skills needed to be dealt with more thoroughly than they were in schools. Some C&G course appear to be more directly relevant to students, and allowed them to move faster through the course although subsequently one student had to 'fill in the time' by practising welding.

**The Centre for Research in Youth and Further Education is a joint venture of the Department of Educational Studies at the University of Surrey and the School of Education at Roehampton Institute of Higher Education.**

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